An Overview of Usability for the Study of Users' Web-Based Information Retrieval Behavior

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This article provides an overview of usability literature and testing methods. Usability is a term shared by a wide variety of interests in the commercial software development arena, and it is a notion that argues for the centrality of the user—a focus long held by the library and information science (LIS) professions. As more information centers and libraries turn to a Web-based portal to introduce their users to the resources and services they provide, the need to create usable Web-based information displays emerges as a critical task for LIS professionals. Usability testing can be helpful in capturing the user's experience with electronically provided information and can be helpful in determining the success of Web-based efforts. Usability testing techniques can be developed as a curricular focus without expensive lab equipment. Further, these elements seem a natural approach for developing in LIS graduates, and in our own efforts to understand the effectiveness of Web-based information services, the ability to better assess a user's information-seeking activity. Some thoughts are also provided on ways that usability could be incorporated in present LIS curriculum. This study was initially supported by a research grant proposal award from the Association for Library and Information Science (ALISE) 1996–97.

The Web has brought unparalleled access to information of all types. Along with that access comes a growing awareness, both within the Web-site development community and among Web users, that the ease of communication enabled by a Web site can vary greatly. The LIS professions have also realized that they now have a new information environment with which to assist users. Such assistance will undoubtedly mean the development of a "portal" site that eases the user through a wider range of sources and services than could be provided previously through an online public access catalog (OPAC). For most of the Web's initial years, Web sites were largely a source for creative self-expression, and more often the novelty of the medium kept users from being critical of the content encountered. The last two years have seen a decided shift toward the Web as a medium for communicating useful information that has the potential to aid individuals in solving problems. Commercial Web sites enable users to find, compare, and purchase products and services. Governmental Web sites work best when they provide citizens with helpful procedural or

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regulatory information that improves the functions of government in daily living. Educational and health-related Web sites have exploded in number, providing both educational content and the ability for users to interact with others and with that content as they seek services and useful information. However, as Web services and Web content increase, so does the complexity of the options and information that must be digested and navigated by the user. The limitations of conveying complex resources and services through a very limited display space, often appropriately referred to as "screen real estate," is quickly seen when imagining the resources and services of a major research university or large metropolitan public library reduced to such a communication "space."

Libraries have begun giving serious attention and resources to the creation of Web sites that can provide access to their holdings and services.[1] As the attention given to these Web-based interfaces grows along with a concern for the success of their effectiveness in communicating with the user, the competency and skills of the LIS professional to measure the success of that communication need to grow as well. Under the term "usability," a variety of tools and techniques are being developed that can assess a user's experience with an interface and particularly the difficulties that the user has when attempting to retrieve information through a Web-based interface. An understanding of these usability tools assists the LIS professional with an improved understanding of the user's information retrieval behavior in ways that have been difficult to obtain previously. These tools can also aid greatly the process of "tuning" an interface to provide the greatest degree of benefit to the information seeker.

The intent of this article is to share some of the methods and philosophy of usability that have emerged over the past several years. It is hoped that LIS faculty will find these resources valuable in considering the development of professional skills needed to evaluate users' online information retrieval experiences. If one were to develop a course or a module to teach usability measurement skills to LIS graduates, to what resources might one turn? What readings or Web sites might guide such an effort? An initial discussion of usability is provided, followed by a discussion of the elements involved in a usability effort—the user measures to be considered, the mechanisms (laboratory, software, etc.) to capture the user's interaction with the system or interface, and, finally, some sample usability tasks and techniques. A concluding section addresses possible LIS class activities and course contexts for usability.

Usability is not a new idea, but its application to the Web is relatively new. The ubiquity of the Web as a communications medium has meant that the success of Web-based efforts for communication, or the usability of a Web-page layout, play a dominant role in determining an effective Web page or Web-site design. The process of testing actual end users on a Web site is a natural application of usability techniques, evolving from similar efforts with software applications' interface design. However, measuring Web-site usability is a more complex problem than the

commercial software interface design development that initially was intended for usability testing. A Web interface typically offers a more complex selection of navigational choices and information use options than have been observed with more traditional information services. For example, a recent effort has identified more than thirty separate user tasks possible on a Web browser and has provided a coding protocol to assist researchers in identifying users' behaviors in response to these tasks.[2] The content retrieved with each click of the mouse can be arranged and described in a variety of ways with each new page presenting a new landscape for the user to assimilate and navigate. One can hope, just as an eventual structure evolved for the printed book, that a standard or format for effective Web design eventually will evolve. For the present, however, much of the Web design guidance has emanated from a few "information architects" and Web-site designers from a variety of backgrounds and who bring their own particular concerns and emphases.[3]

Many Web sites, whether commercial or noncommercial, carry the task of representing to the reader both content and the services regarding that content. This task is not substantially different from the primary mission that motivates current information centers and libraries. These institutions offer the user the "bricks and mortar" components that help in navigating the holdings, and although libraries cannot be considered by all as easy to use, they have developed certain standards of practice upon which the user can rely. They also provide a group of professionals and paraprofessionals who are available to help. The Web lacks many of these standards as yet; instead, it offers a more complex set of possible information structures and browser interactions for the user to assimilate. It is also likely that there may be little assistance from a human intermediary nearby. Usability analysts themselves are quick to argue that the task of determining the user's degree of success in these hypermedia environments is difficult to assess. Several of the newer guides outlining the techniques of usability testing make a clear distinction between Web-site usability and software application usability, asserting that the former offers a new, more problematic realm for usability study.[4]

A Brief Look at the Term "Usability"

The term "usability" has achieved serious attention from the Web design community with national conferences focused upon the benefits it offers, particularly to commercial "storefront" sites on the Web. But the term "usability" can carry a variety of meanings. The use of the term in the INSPEC database, found in the late 1960s, refers to the usability of certain physical materials—resins, wire, steel rods—used in the development of building and insulation products. The term "usability" in proximity to the term "user" emerged in the mid-1980s as the user-centered approach to systems design began to develop. Early in that period, usability often referred to the testing of written communication (e.g., documentation, owner's manuals, etc.) that focused on software operation. The usability testing of various display formats like computer-output-microfilm (COM) was also common in the 1970s and early 1980s. The testing of a software product's interface became a stronger application in the 1980s when it became apparent that testing a software product with actual users could improve customers' satisfaction and hence the profitability of the final product. As the delivery of information content through computer applications

has increased, so has the frequency of INSPEC postings for the term, more than doubling between 1992 and 1995, with the advent of the Web.

Within the LIS literature, there are a variety of individuals who have made use of usability methods to assess users. Video-based usability testing methods were described in the late 1980s in OCLC's *Annual Review of Research*.[5] Similar to the citation patterns found in INSPEC, LIS databases show a steep increase in the frequency of the term "usability" in articles concerned with computer-mediated information seeking.

A recent and useful article by Gluck, who has developed a usability lab for the LIS program at Florida State, provides a good evolutionary overview of the usability approach. He explains that "usability" is frequently understood by the other terms it often modifies. For example, usability *engineering* is used many times to refer to the involvement of the user during the entire software/interface development process, beginning with a needs assessment of the user group to be served by the software and continuing through various design iterations as the product evolves. Usability *analysis* or *inspection* tends to refer to user testing further along in the development process to fine-tune particular elements of the interface. Usability analysis of a word-processing application, for example, often presents the user with a fairly simple task to perform and then looks at the keystroke errors or moments of indecisive behavior displayed in carrying out the task. Finally, usability *testing* is frequently used to assess a completed (or nearly completed) product in some fairly realistic user setting.[6] Bringing the user in at the "about to be released" stage becomes a combination of usability and what also has been called "acceptance testing." This involvement of the user near the completion of the design for a commercial product can involve serious attention from sales and marketing divisions as well as usability specialists.

Currently, judging from visits with Austin-area corporations that maintain usability labs or initiatives, these distinctions between usability engineering, analysis, and testing often become blurred. In the process of software design, interface development, or Web-site design, the issue of when to involve the user can become a highly political and expensive question, and is often determined largely through the corporate culture of the company. In many cases, the role of usability is still evolving as an element of Web-site design, but it seems very much in keeping with the user-centered focus of the LIS professions. Usability testing skills surely deserve to be included in the development of today's LIS professionals.

The User as Study Object on the Web

Most LIS programs now provide some classes, if not a full course, in user studies. LIS research on users' information-seeking behavior is also extensive and cannot be adequately discussed here. But whether a user-studies module stands alone as a course or is considered in relation to other course content like that found in a Web design, a research methods, an information sources and services, or a collection development course, the user is generally seen as the raison d'être for all that the LIS professions seek to do. However, the actual measurement of a user's success with or value derived from an electronic information system can be quite problematic.

Over the past fifteen years, we have changed the ways in which we study the user. Until the mid-1980s, the view of the user was that of a mysterious "black box." An assessment of the user's inter-

action with an information retrieval system was captured largely through simple "Yes/No" relevance judgments or through the study of OPAC transaction logs. It was difficult to know if users' interactions with the system were eventually useful. However, the interaction with the system has changed with the development of graphical user interfaces, coupled with the interactivity they foster between the user and the visually displayed information objects. There is a stronger belief on the user's part that the system should deliver the information needed and not just a citation to another source that might be helpful.

The change in what the user expects has been accompanied by a growing emphasis in the LIS research community on qualitative research methods. Qualitative research methods have led to greater efforts to examine the psychology of the user—often taking the form of verbal "think aloud" data that help to elicit some of the internal reasoning or emotional states behind various information-seeking behaviors. More quantitative research methods applied to the information-seeking behavior often concern users' individual differences—factors like the user's cognitive abilities, gender, and other differences (e.g., age, subject expertise, etc.) that might be helpful in explaining some dependent variable used to capture observed information-seeking behaviors. These individual differences affect the way in which the user thinks, learns, and takes action in various situations and they have been useful in partitioning groups of users so that more qualitatively accessible behaviors can be detected. The psychologists who study individual differences are far from reaching a consensus about how these differences arise, but there has been some effort to create diagnostic instruments for the detection of some of these differences. An understanding of these instruments and their value in the detection of these differences can be developed without a strong background in psychology. While this paper cannot provide a complete review of the research in the area of cognitive and affective factors influencing information-seeking behavior, there have been some excellent efforts to provide such understanding for the LIS field.

Allen has provided an invaluable roadmap through a great deal of the research that has been amassed in an effort to understand the user and to design more effective systems to respond to the user's information-seeking behavior. Allen finds that after many years of electronic information systems design and user studies, the systems are still far from the usability the user has every right to expect.[7] He is an appropriate starting point for guidance in developing a more usability-sensitive professional because of his familiarity with testing the user's cognitive abilities in information-retrieval experiments. Marchionini and Dillon also have provided very comprehensive texts covering a wide sampling of the research exploring various user-centered aspects in electronic information environments. Both authors address user-centered factors (individual differences) as well as factors external to the user that can affect the user's information-seeking experience in electronic environments.[8] Dillon and Watson provide a helpful overview of the research concerning the impact of individual differences on users' computer interaction.[9] Borgman and Bellardo provide introductions to the study of users' individual differences with information systems. Bellardo's work looks at factors like creativity, verbal and quantitative ability, and self-esteem as they affect the quality of an online searcher's final results, while Borgman examines academic orientation and a variety of personality

characteristics as they affect information-retrieval performance. Both authors provide a helpful review of the literature on individual differences.[10]

Usability advocates from the interface design community like Nielsen tend toward simpler categorizations of users' differences. While a variety of factors affect a user's performance, Nielsen believes simpler, less cognitively oriented categories can be more easily identified and can still account for a fairly large degree of performance variance. Looking at ninety-two published comparisons of users' performance on hypertext interfaces, he found that three basic differences could account for roughly 40 percent of the performance variation in users. Other types of differences may account for portions of the remaining 60 percent, but due to the speed of Web development, attention is often paid to the single factor that can contribute the largest improvement. The three individual differences that Nielsen identifies are all basically "novice versus expert" differences—either in experience with the system, experience with computers in general, or in experience/knowledge about a subject or task domain. Establishing measures for these differences is usually accomplished through questionnaires that determine length of time the user has spent with the system, the interface, or the topic, along with some estimate of frequency of use. Nielsen also notes that level of experience cannot be expected to account for all differences in users' performance since even an expert with a system may be a novice at some aspects of it.[11]

Individual differences range from some that are easy to identify, like gender or age, to some that involve less observable characteristics, like the user's cognitive style or affective factors.[12] The Embedded Figures Test (EFT) is an example of an easy-to-apply instrument used by some in the hypermedia research community to measure an individual's cognitive ability to disembed the needed clues for successful navigation of a Web site where those clues are often embedded in a complex field of visual objects. Witkin developed a simple paper and pencil test that can determine whether someone is field dependent—seeing the visual field as a relatively fused whole—or field independent—seeing the field as an easily deconstructed arrangement of independent components.[13] In the 1960s, the test was used by Karp, Witkin, and Goodenough to examine a variety of learning and social situations.[14] With an eventual link to learning styles, the field dependence/independence dichotomy has gained more recent attention in examining users as they navigate through complex hypermedia environments. Ellis, Ford, and Wood, and Leader and Klein are among a number of researchers to use learning styles similar to field dependence/independence to examine users' information-seeking behavior in hypermedia environments.[15]

Access to instruments like the EFT, the Group Embedded Figures Test (GEFT), and the Children's Embedded Figures Test (CEFT) can be found through publishers of psychological tests and measurements. These avenues usually require the purchaser to possess consulting psychologist or educational psychologist credentials and consequently can feel quite intimidating to LIS faculty without such a background. This author found a willingness on the part of some of the psychometric publishers to discuss the use of various tests and to allow the purchase of some instruments when the request was accompanied by a purchase order clearly carrying the university affiliation of the requestor. The ERIC Clearinghouse on Assessment and Evaluation at the Catholic University of America is an excellent first step in

locating information on various diagnostic tests for individual differences. Its Web site provides both descriptive and contact information concerning a broad range of possible instruments that have been used to measure various human factors.[16]

Among the literature of psychology, Sternberg has published on the study of human intelligence and thinking styles. One of his recent efforts provides a clearly written overview of the application of a variety of psychometric approaches to the study of human cognition and information processing.[17] Other psychological scholars have explored gender and online persona effects for users' online interactions. While these authors do less to address users' information-seeking behavior, they provide a basic understanding of the influence that an online environment can have generally on users' behavior. Wallace provides a recent overview of research that covers a broader view of the Internet as a social as well as an information source. She includes the Web along with specific applications to be found on the Web such as e-mail, synchronous chat spaces, text-based virtual reality environments, and asynchronous discussion forums.[18]

Two recent books by Birnbaum seem ideal for the researcher who desires to use the Web as a collection mechanism for users' attitudes and responses to various behavioral questions. His introductory title is clearly intended as a graduate level textbook and provides simple instructions on creating Web pages to gather data along with basic methodological and ethical concerns. Birnbaum's second title is intended primarily for researchers who desire detailed examples of Web-based experimental efforts and a thorough discussion how such efforts can be used without threatening the validity or reliability of the results obtained.[19]

The User's Interaction with the System/Interface

The graphical user interface, or Web browser, that enables the user to interact with information on the Web presently comes in two prevailing "flavors," Microsoft's Internet Explorer and Netscape's Navigator. While there are frequent new browser versions, the basic functionality of the browsers has remained quite similar, offering an environment stable enough for establishing some standard measures of user task types and navigation styles. Some researchers have made strong contributions toward this end. Chen and Rada, after looking at twenty-three experimental studies on hypertext systems, identified various measures of hypertext search efficiency and effectiveness. They found a serious need for more homogeneity in the use and development of these measures within the hypertext research community, and call for the development of taxonomies to better compare task types, user differences, and hypertext tool use. Quantitative variables like task completion time, average time on a hypertext link (node), and number of links or nodes visited in completing the task, were found to be used in many of the studies surveyed. These measures were often called measures of search efficiency or search effectiveness. Chen and Rada's meta-analysis also pulls together a rich array of studies that use individual difference measures like learning style, spatial ability, and cognitive style, in combination with task types (usually open and closed) to examine the effects of these various measures upon measures of hypertext search efficiency.[20]

Use of various browser interface features, like the "back" and "forward" buttons, "jump" tools like the "History" list or a "Favorites" list, have each been linked to different cognitive styles as

preferred methods of navigation. For example, Palmquist and Kim found interesting differences between field dependent and field independent users and their use of more linear search tools like the "back" and "forward" buttons, in preference to more nonlinear tools like "Favorites," the "History" list, or entering a URL directly.[21] As browsers change to more customizable interfaces for a Web-search experience, such individual differences need to be understood and anticipated by Web-content developers.

Usability Laboratories

Usability labs, often costing tens or hundreds of thousands of dollars, have made use of videotapes to provide both an overview of the test situation and to obtain a record of users' screen navigation decisions and "think-aloud" protocols during users' search sessions. Having the space and equipment budgets to create such laboratories are often beyond the realm of possibility for many LIS programs. The graduate school of library and information science at the University of Texas has taken a "budget" approach, using software resident on the testing computer to capture screen navigation decisions and also users' verbal protocols, when needed. There are several options for such software, and serious trade-offs need to be considered, particularly if the video option is possible.

Video, converted from the test computer's digital screen display, can also carry a small special effects window that permits a view of the user's face or body language as the test proceeds. In addition, it is sometimes possible to predetermine the types of user problems that may occur and then to program function keys on a second, mirrored computer to correspond to these predetermined problem types. As the user proceeds through the test situation, a plain log of the test session can be generated on this second computer such that the log is coordinated with a time stamp made on the user's computer and recorded on the videotape. The log can be quickly surveyed to find the number of instances of a particular problem and also the time-stamped occurrence of the problem. It may be important to know what the user was doing right before or right after the problem was encountered. Primarily, however, the videotaped tests become a vehicle by which developers can specifically be shown the usability problem found by the usability specialist. Nielsen provides an overview of a usability laboratory—equipment and floor plan. He also offers a good discussion of the issues to be considered when using the more expensive option of screen output through a scan converter to videotape.[22]

For a more economical approach, software can be used to capture the user's screen navigation as well as his or her "think aloud" protocols, obtaining a good many of the benefits of a videotape without the expense of the scan converter to move the computer screen display to a videotape. An additional benefit to the economical approach is the clarity of the final image of the screen display. The videotaped image is often too grainy to see easily the details concerning which link(s) the user tries or what the user types into a search window. The following three software applications have been used at the University of Texas usability lab for obtaining this level of screen navigation detail—Lotus' ScreenCam, TechSmith's Camtasia, and WinWhatWhere's Investigator.[23] At this time, each of these is available for a free fifteen- or thirty-day download and each is priced at $150 or less.

Users' Actions: A Sample of Usability Methods

Once the software is prepared to record the users' Web navigation, it is useful to consider the types of tasks the user will be asked to perform. First, recruit sample users, and using a prescreening mechanism, select users so that some control can be established for experience level or one of the other individual differences like cognitive style. Lab space needs to be available to record the users' reactions. Next, find an appropriate task or technique to test users' ability with (and the usability of) the system or Web site. A variety of helpful guides are available. The tasks the user is asked to perform determines, to a large degree, whether you study what the user does using an existing interface or whether you observe testing of particular features of the interface itself. Mayhew provides an excellent and detailed handbook of various methods that can be applied at different points in the development and testing process, from an initial requirement for organizing a task-related needs-assessment of a user community to testing the user on some feature of the final product. The tasks and techniques suggested by Mayhew largely depend upon the type of data desired and the point reached in the development process.[24]

If the interface is fairly complete and there is a need to observe the user's experience with the interface, there is general agreement by many usability proponents that large numbers of test subjects are not necessary. Nielsen, in a recent posting to his *Alertbox* publication (found on his company Web site), presents an explanation and graphical illustration of why as few as five users will reveal a large majority of usability problems. To find all the problems, he contends that only fifteen users need to be tested.[25]

Early in the development of an interface, a "heuristic evaluation" may be appropriate. In a heuristic evaluation, the interface designers or some of their "inner circle" examine the interface to find early evidence of usability problems. This approach requires no users, but of course, such an examination often fails to reveal the problems that will eventually come as a surprise to the designer. A "think aloud" approach may be used with either developers' reactions or those of users new to the interface. These "think aloud" protocols are often helpful in revealing the user's misconceptions about a link or a semantic description of an interface feature. In a recently observed usability test at a local commercial e-commerce vendor, one user stated, "I don't understand the difference between this heading called FIX IT and that heading called LEARN. Aren't I trying to learn how to fix it?" The test is a fairly specific task, like seeking help for a printer malfunction on a technical support Web site.

The concerns of an LIS professional may focus on a less structured "browse and bookmark" task. The request to the user may be, "You have a friend who has been diagnosed with diabetes. Use any Web browser and any search engine you prefer and find relevant information about the disease. Please comment aloud as you work on the information problem and bookmark the links that seem most valuable." The investigator is seated near the user and can occasionally prompt the user to "please tell me what you are thinking while you work." Time limits may be set on such an activity since the user may have difficulty feeling the task is complete. Of interest to the observer would be the clues that distract or to which the user responds. It is also useful to test the user's ability to navigate a site efficiently by imposing a "known item" search. This requires the user to find a "known to exist" page on a

Web site and provides evidence of the user's search efficiency by comparing the number of links the user traverses against some known minimal number of links required. An ideal known item would be a specific form that is of importance to the user and is known to exist on a site. Evidence of the user's task completion, for example, would be the location and printing of the form.

Another technique for obtaining users' reactions to a particular design or feature is a "task-centered focus group." Usability advocates differ on whether focus groups constitute a usability method, but they generally agree on the usefulness of such groups when a representative group of users can be gathered. For a "task-centered" focus group, select four to eight users at the same time and place, locate each participant at a computer, and using the interface to be tested, ask each to perform a task that they regularly need to perform. After they have had some time to explore the interface while performing the task, the subjects are moved to a more central area of the room away from their computers and asked to discuss what they liked, had difficulty with, or what surprised them in the use of the interface. Such a task-centered approach keeps the discussion on the issue of the interface design, but still allows the synergy that comes with focus group data collection. Of course, formal written or on-screen questionnaires can also be tailored to gather users' opinions. But these may be better used when the interface has first been subjected to a "talk aloud" analysis from a smaller set of users. On-screen surveys are likely to be annoying to a user when mounted on an operational site; however, they are a common approach in commercial environments where a third party is asked to "Web host" such a survey. Using Birnbaum's book, "Web hosting" one's own survey becomes much less intimidating.[26] There are also companies that assist with "Web hosting" surveys for a fee. Submitting the query phrase "Web-based surveys" or "Web-hosted surveys" in any major Web search engine returns a plentiful number of companies from which to choose.

Conclusion

The foregoing discussion is offered in the hope that LIS faculty considering the prospect of developing usability courses or modules will find this information useful in furthering their efforts. The basic requirements needed to examine the usability of a Web site or other software interface are modest enough that some attempt to provide students with such an experience is not beyond the bounds of what is affordable. A standard PC can be equipped with the necessary zip disk or recordable CD drive required to capture the files enabled by various screen capture software applications. The software applications described in the references and notes section are all priced at less than $150, and the value to be derived from testing only a few users has been shown to be worth the investment. As LIS continues to improve an understanding of Web-based delivery of information services and resources, the effort to provide some degree of user testing can produce better Web-design efforts. This clearly is a high priority for many in the e-commerce and for-profit business community. In the nonprofit sector as well, the Web has given real meaning to the importance of user-centered design practice. The Web certainly provides a valuable communication channel between the user and LIS professionals who seek to serve the user's information needs from beyond the physical environment of the library or information center. The Web also provides the opportunity to monitor multiple users' aggregate search behavior in

ways that were not previously possible. The mechanisms for understanding users' information-seeking behaviors are greatly improved with an understanding of usability.

Concerning the place of usability in the LIS curriculum, the possibilities that seem most suitable are as a component of either a user-studies course or as an evaluation effort in a Web design course. Usability testing techniques in a user-studies course would support an opportunity for students to see, and also perhaps hear, the user move through the various stages or components of an emerging set of models for information-seeking behavior.[27] When the user is browsing, what critical decisions are made? When has the user found enough? What constitutes a valuable or relevant Web page in the user's thinking? How does the user judge the quality of a Web page when confronted with many Web pages? How easily is the user led in some altered direction?

An unexpected result occurred with research practicum students at the University of Texas as they provided pre-freshmen with a short tutorial on using the Web. The tutorial was followed by capture of the undergraduates' verbal and navigational reactions to the browser's screen displays while they searched for any topic of interest. The range of verbalized assumptions made by each novice user about various browser responses was extremely insightful for those who were providing the tutorial sessions. It was clearly evident that each "trainer" learned a great deal in these sessions and immediately put that understanding back into the conduct of the next tutorial.

A similar use for these captured user sessions might be in an online searching course to illustrate some of the logic used by end users when searching the Web. This type of activity would be relatively easy to facilitate with a usability testing space where the user and the trainer could work comfortably together without being overheard by others. True novice users may be more difficult to identify, since many high school students currently arrive at college well-acquainted with the Web. The novice users mentioned above were recruited in Austin through an off-campus tutoring service that helped pre-freshmen with remedial and English as a Second Language (ESL) training.

As a module within a Web-design course, usability testing is an effective approach for the evaluation of a student's Web design. Such efforts are currently used at the University of Indiana. There is a need for those who provide Web-based information to have better measures of users' experience on the sites they create. Server logs were intended to support this purpose, but the ability to clearly discern a user's reason for moving between or for leaving particular sites cannot be adequately addressed with a log entry. Server logs, much like OPAC transaction logs, may provide the "what," but not the "why," of a user's navigation decision. Haigh and Megarity provide an effective introduction to the content and limitations of server logs. They explain that a server log can indicate the number of pages a Web site is asked to serve to "visitors," the Web address from which the visitor's request was launched, and the browser and operating system used by the requesting site. Server logs can also indicate an increase or decrease in the rate of a site's use, but very little else that would be meaningful to an interface designer.[28] Testing an interface design does not necessarily require that the designer be the usability test conductor. Students can select any existing Web-based information resource and can test a user's experience with that interface.

As future LIS professionals and the programs that produce them adjust to a

more digital future, it seems certain that an understanding of users in electronic environments will be a definite advantage to the profession. In some very profound ways, the function of helping the user adjust to a variety of different commercial interfaces is changing. The user desires an information-seeking experience that provides the information needed with a minimum of effort. The Web, as a ubiquitous environment that is relatively easy to understand, has certainly attracted the interest of millions as a mechanism through which they expect to obtain the information needed for many of their daily pursuits. Usability techniques enhance the ways in which the LIS professional can observe and can learn to anticipate the user in this Web-based information environment. Many in the usability testing community see these techniques as a mechanism for the improvement of a commercial product.

However, the LIS professional, armed with just a few usability techniques, can better understand the user and can make a contribution as either a designer or trainer for a nonprofit information service or as a for-profit information product developer.

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23. Lotus ScreenCam comes with Lotus SmartSuite or can be purchased alone. The cost is less than $150 and details about the application can be found at www.lotus.com. Lotus' ScreenCam (97 edition) works with Windows and Windows NT platforms and is intended as a "show and tell" application for demonstrations and tutorials. The program captures onscreen action, plus sound (verbal or other) in order to create movies of any Windows application. It is also capable of using captions or subtitles and includes the player for viewing saved files. File size for a thirty-minute session with "talk aloud" protocols could easily approach one megabyte. Camtasia is priced much the same as Lotus' ScreenCam. More information about Camtasia can be located at www.camtasia.com. It is similarly intended as a screen camcorder and video production tool. Compatible with Windows 95, Windows 98, and Windows NT 4.0, it is intended to produce videos of Windows desktop activity and to provide voiceover capability to create software tutorials or presentations. Camtasia produces industry-standard AVI video files as well as Microsoft or RealNetworks streaming formats. Any standard player can be used to view the recorded files, including the Microsoft Windows Media Player or RealNetworks' RealPlayer G2. At this writing, Camtasia has a superior type of file compression and as a consequence produces significantly smaller files than Lotus' ScreenCam. Investigator is a

logging software that captures the user's individual key strokes and mouse clicks. It is intended as a workplace "watch dog" for monitoring employees' use of computer resources. It provides several different types of displays for examining usage logs and enables an easy "count" of the use of various site types and navigation tools. File sizes are much more modest and it runs compatibly with ScreenCam. Information about Investigator can be found at www.winwhatwhere.com.

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